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## The Johns Hopkins Biological Laboratory

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## THE JOHNS HOPKINS BIOLOGICAL LABORATORY.

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W. S. WINDLE.

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For the past fifteen years it has been customary for the members of the biological department of Johns Hopkins University to devote their summer vacations to pursuing their studies upon the sea shore, where living marine animal forms may be secured for daily use.

The Johns Hopkins Marine Laboratory, as the organization is called, is under the direction of Prof. W. K. Brooks, and has been confined to no permanent location, but has been moved about from place to place as the wishes of those most interested demanded. The work of many seasons was devoted to the study of forms found in the waters of the Chesapeake Bay. For six years the laboratory was stationed at Beaufort, N. C. Then three summers were spent in the waters which bathe the shores of the Bahamas; Green Turtle and Binning islands having been chosen as stations for biological research. Finally the organization went as far south as the island of Jamaica, upon the coast of which it has spent two seasons.

The site of the present marine laboratory is Port Henderson, a private seaport on the south side of the island. It is a quaint old village of a dozen buildings or more, used as a seaside resort for Jamaicans of leisure and wealth. A more attractive and suitable spot in that vicinity could not have been found for our party of seven.

In the immediate rear of the village Salt Pond Hill rises abruptly to a height of 1,000 feet or more, and upon its highest point are the ruins of an old stone fort known as Rodney's Lookout. Here, in the early days of pirates and buccaneers, Admiral Rodney had his stronghold, whence he could look out upon the harbor and open sea and detect the approach of hostile visitors. From the verandah of our laboratory, which was within a stone's throw of the sea, we were afforded a grand view of Kingston Harbor, in which the entire fleet of the English navy might anchor with safety. To the north of the village the low sandy beach extends past the village of fishermen's cabins, and beyond old Fort Augusta to the Rio Cobra river. Across the harbor, four miles away, Kingston, the capital of the island, appears in dim outline. Across the neck of the harbor, two miles to the southeast, the old town of Port Royal stands upon the end of a low, narrow promontory, known as the Pallisadoes. To the south the shore rises rapidly to form a steep, rocky and dangerous coast. Between this coast and the pallisadoes, the harbor opens out into the deep waters of the Caribbean Sea. The beautiful landscape stretched out thus before us was completed, from an artist's

standpoint, by the Blue Mountain range, which formed a dark gray background to the east and north, leaving the boundless sea to meet the horizon in the southeast.

The building which we termed our Marine Lab. was a large one-story stone structure known as the "Sister-Houses." It was light, airy and comfortable, affording ample room for our party of seven. Each member of the company occupied a separate table and upon this his microscope was placed, together with a varied collection of specimens, preserving fluids, dishes, aquaria, scalpels, needles, pipettes, etc., the whole forming a veritable biologist's corner. It was through the kindness of Dr. Brooks that we secured a temporary loan from the Johns Hopkins Biological Dept., of all the necessary chemical reagents, general apparatus, many valuable books of reference, etc., to equip our seaside laboratory very fully and satisfactorily. We had a sloop and light row boat at our command, also the services of a native boatman. While we were supplied with more than that needed for our immediate wants, yet a steam launch and apparatus for deep sea dredging by steam power, would have been very acceptable. It is hoped that these additions will be made during next season.

The location at Port Henderson offers many facilities for biological research. Numerous small coral islands, so called Cays, from two to ten miles out at sea, are rich in Crustaceans, Anemonae, Ophiurans, Astrophytions, Serpula, Terebrella and numerous species of Alcyonaria, Astraea and Madrepora. Near Port Royal were numerous mangrove ponds—where the bushes hang extended into the shoal water so as to form ponds and channels of quiet sea water—we found life very abundant there. Clusters of Clavelina, Simple Ascidians and colonies of hydroids grew upon the mangrove roots in endless profusion, while star fishes, sea urchins and Holothurians were abundant.

A large salt water lagoon two miles south of our laboratory and along the coast was inhabited by numerous crocodiles and turtles. There we also found a large jelly fish—cassiopeia in abundance; also gasteropods and crustaceans. The surface collections in the bay afford an endless variety of forms for study. Good opportunity for work is also found on land. The hill in the rear and the broad valley of the Rio Cobra river not far away are stocked with land crabs, lizards, termites, scorpions, etc. Bird life is not so abundant as we had anticipated, and the herpetologist will find no snakes, but only the mongoose in their places. The flora of Jamaica is rich and varied; ferns, palms, crotons and cacti predominating.

By those best acquainted with the coast of Jamaica, the site of Port Henderson is considered to be the most suitable location on the island for a permanent marine laboratory. As indicated above, it offers superior advantages for study of animal forms in the tropical waters. Situated in the immediate vicinity of Kingston all the temporary needs of the school may be readily supplied. It is also in direct communication by steamer and cable with New York and Liverpool. The location affords such general satisfaction that prominent biologists at home and abroad have considered plans for establishing a permanent international marine biological station at that place. It is sincerely desired that all preliminary steps taken in this direction may lead ultimately to the establishment of the much needed institution on American shores.

A complete report of the various expeditions taken by our party with detailed accounts of collections taken, also of the work of each student, explaining his methods of preserving and studying material, would require more time than the present occasion admits; suffice it for the present to submit the following:

PRELIMINARY NOTES ON PELAGIC ANIMALS FOUND IN KINGSTON HARBOR.

The only suitable times in the day for surface collecting were early in the morning or late in the evening, when neither land nor sea breeze disturbed the placid surface of the water. Our outfit was quite simple, consisting of a light row boat, two water pails and two nets of fine silk bolting-cloth. The nets were similar to dip nets in shape; no handle, however, it being replaced by a long cord arranged to draw the net horizontally through the water. When engaged in surface-collecting we usually rowed out upon the bay a half-mile or more from shore, then threw over the nets to drag from the stern of the boat. Richest collections were taken when the rims of the nets extended partly out of the water, so as to skim the surface to a depth of twelve inches.

Huxley recommends following the "plancton streifen" or trails of "dead water," but we found so much debris from the shores in these trails that we abandoned them, although richer in animal and plant life than other places. The nets were emptied every few moments in the pails which were one-half full of fresh sea water. After about an hour's rowing we returned to shore, filled the pails with fresh sea water and repaired directly to the laboratory. The catch was examined in a preliminary way, very hastily, by dipping out small portions in glass dishes. These were held toward the light of a window or lamp, when swarms of pelagic forms appeared, swarming about in great confusion. If desirable specimens appeared they were transferred by means of a wide-mouthed pipette to small aquaria of fresh sea water, or put directly into the fixing reagent previously prepared. Small jelly-fish and Ctenophores were removed very carefully by means of deep watch-glasses.

Among the countless multitudes of varied forms taken we found larval crustaceans predominating. Representatives of the Nauplius, Zoea and Megalops stages were all present, a few only of the best, however. Larvæ of shrimps (*Palæmonetes*), land crabs (*Maji*), lobsters (*Homarus*), rock-crabs (*Cancer*), Stomatopods, etc., were among those present. Of adult crustaceans we found Copepods, Lucifers, Phyllopods and Ostracods. No *Nebalia* were taken. Numerous Plutei of Ophiurans and Sea Urchins (*Stroglyocentrotus*), also a few Bipinnaria were collected in early part of July. *Sagitta* represented the Annelids chiefly, while Appendicularia alone of the Tunicates appeared,—no *Salpa* being found as at Binning, Woods Holl, and other places. A number of *Cœlenterates* were always collected in the "tow"—*i. e.*, Medusa of *Obelia*, sections of *Diphyids*, *Aurelia*, a few planulæ, *Irene*, etc.

Large Ctenophores (*Cydippidæ*) continually annoyed by their presence. Larval fish, in various stages of development, also minute adults were frequently caught.

It is interesting to note the fact that plant life was richly represented in the "tow" by numerous species of *Algæ*, *Diatoms*, species of *Protococcaceæ*, also *Trichodema* were determined.

In preserving the delicate larval forms alive in aquaria, for study we found difficulty, and only succeeded by using large glass dishes (scrupulously clean) They were kept from direct sunlight and the water was changed or fresh quantities added every three or six hours, as the case might require.

Several methods were adopted for fixing and preserving the material, according to the character of the specimens in hand.

Medusæ were successfully prepared by—

1. Placing into solution, until they sink to bottom:

$\left\{ \begin{array}{l} 10\% \text{ CuSO}_4 - 100 \text{ c. c.} \\ \text{Sat. sol. Hg Cl}_2 - 10 \text{ c. c.} \end{array} \right.$

2. Into 5%  $\text{K}_2\text{Cr}_2\text{O}_7$ —1-7 days.
3. Wash thoroughly in water.
4. Graded alcohols, 35-90.

Larger Jelly-fish and Ctenophopes were preserved for histological purposes by using—

1. Erlicki's fluid, 6-10 days.
2. Wash in water slightly acid.
3. Graded Alcohols, 33-90.

Crustacean larva were treated.

1. Sat. aq. sol.  $\text{Hg Cl}_2$ —5 minutes.
2. Wash with 33% alcohol and transfer through graded alcohols to 90%.

Other methods were tried but best results were obtained by using those above described.

Surface collections from tropical waters are intensely interesting to the student of animal life. There in the surface water of the sea he finds the great nursery of marine forms, both plant and animal. Further, we are informed, sufficient reason warrants the statement that, likewise, all living forms had origin in minute, free-swimming organisms upon the bosom of the ocean in past ages. A candid study of the life histories of typical animals—in which they pass from a simple cell through various metamorphic stages to the adult forms—confirms the doubtful in the doctrine of evolution. And a true conception of relationships existing between members of so called families reveals the truth of the oft repeated statement, that "the ocean is the original haven of all life." The more we become conversant with marine life the more definitely are we impressed with the fact that it is from that source we must ask further information, that shall throw light upon many Biological problems at present unsolved.

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#### THE VASCULAR SUPPLY OF THE TEETH OF THE DOMESTIC CAT.

C. C. NUTTING, IOWA CITY.

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After all that has been written about the anatomy of the domestic cat it would seem a hopeless task to find any facts of real importance in a field so carefully gleaned by Wilder and Gage and a host of other writers of the past and present.